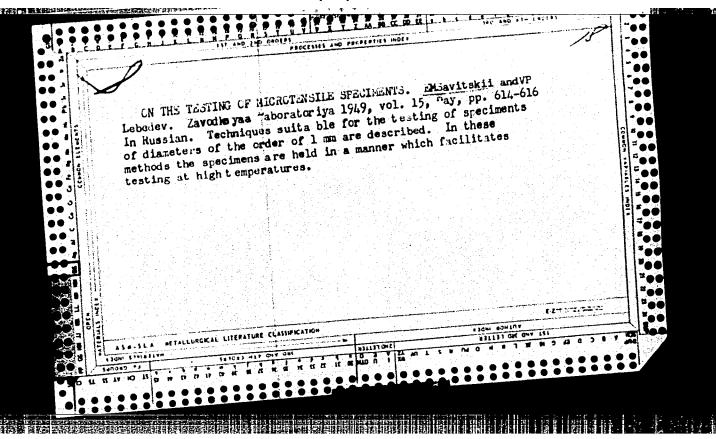
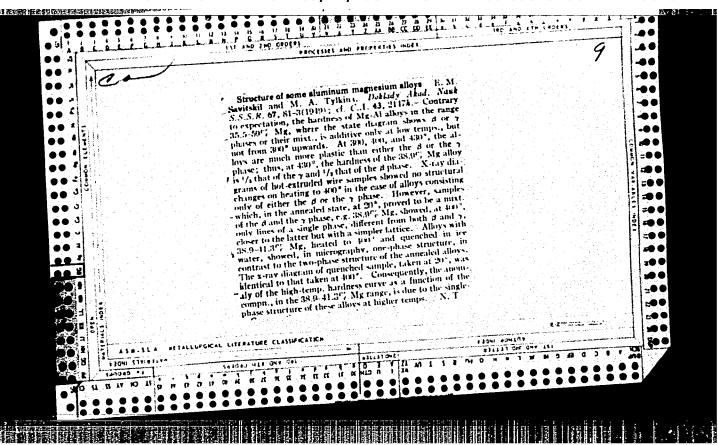
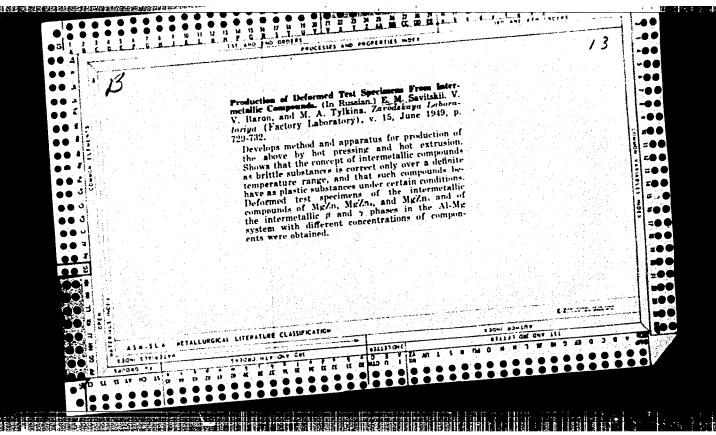
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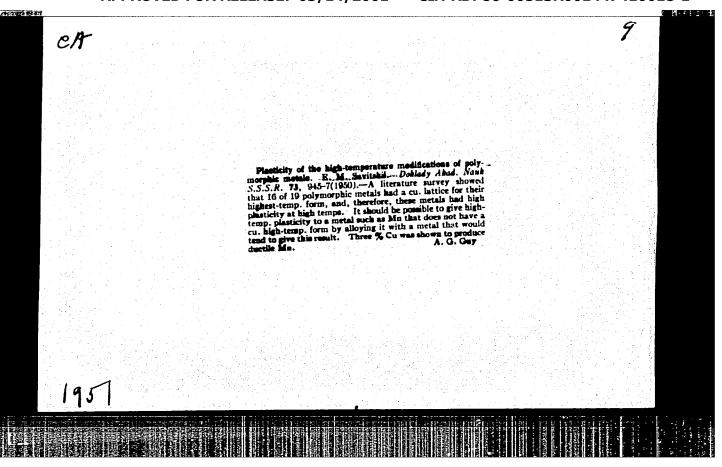




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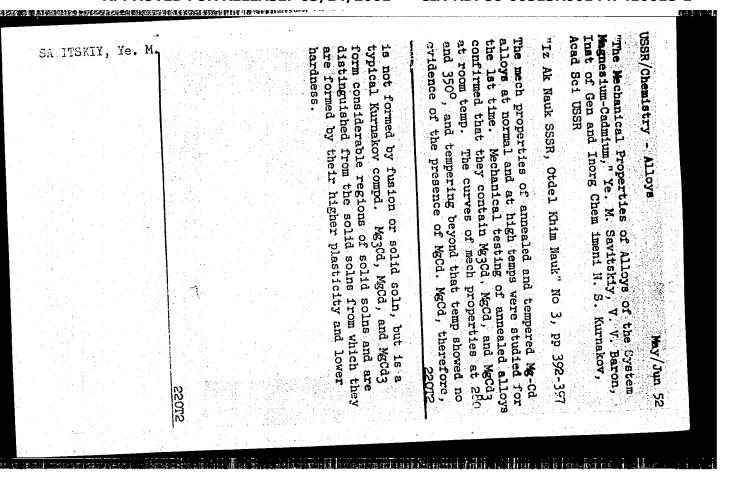


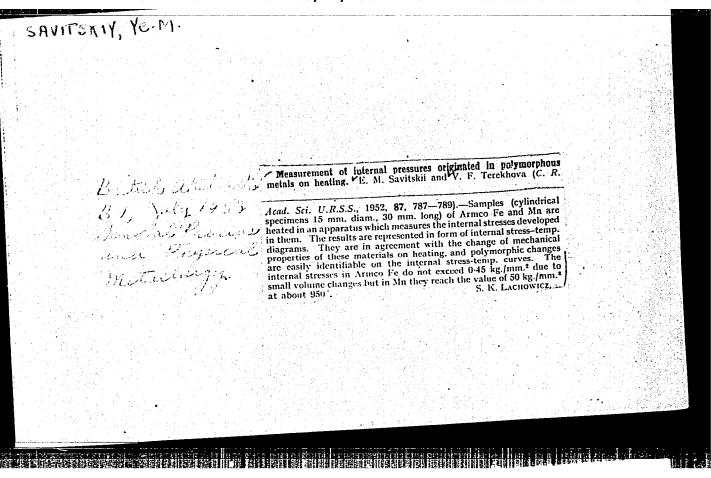
SAVITSKIY, YE. M. - "Investigation of the Effect of Temperature on the Mechanical Properties of Metallic Systems." Sub 2h Dec 52, Inst of General and Inorgnic Chemistry imeni N. S. Kurnakov, Acad Sci USSR. (Dissertation for the Degree of Doctorates in Chemical Sciences).

S0: Vechernaya Moskva January-December 1952

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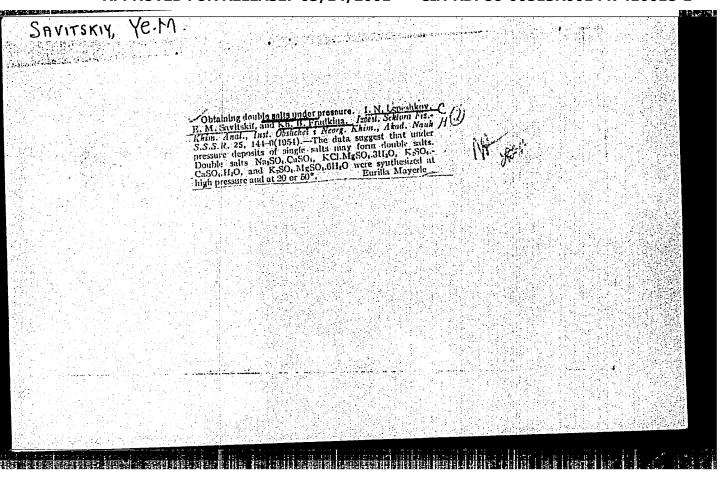


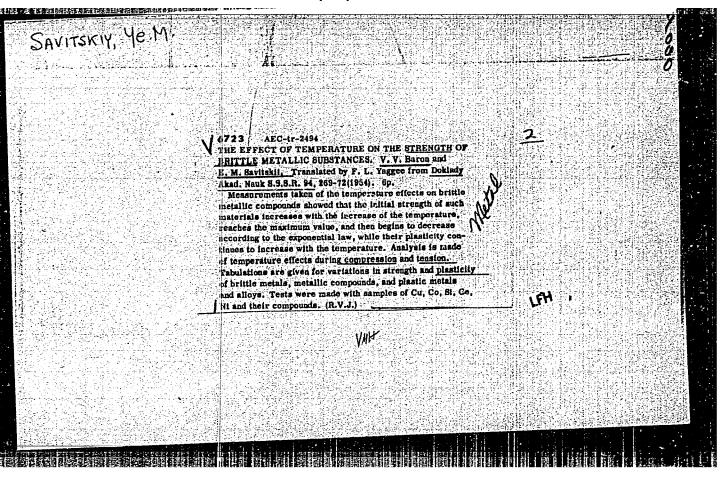


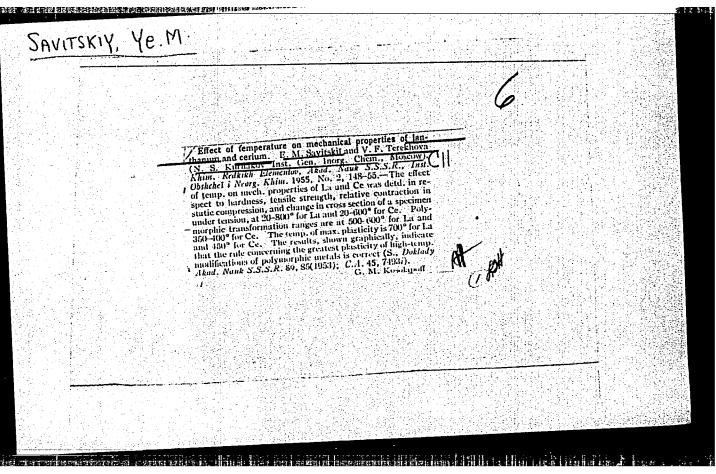
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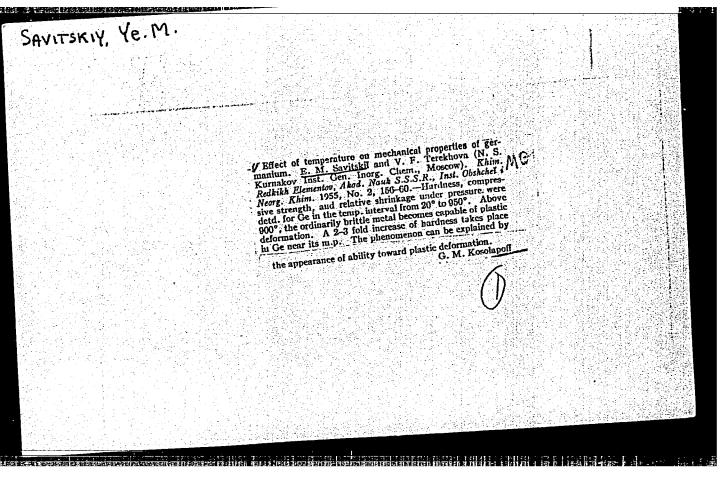
"The Dependence of the Mechanical properties of metals on Temperature in connection

with their crystal structure." Dokl. Aked. Nauk SSSR, 89, 85-88, 1953. For pure metals the change of mech. properties with temp. depends on how much their crystal structure is affected by temp. changes. From this point of view pure metals can be divided into 3 groups. (1) Metals for which temp. chaanges do not result in a change of crystal structure. For these metals phys. properties show no drastic changes with temp., and the changes are continuous. All monomorphic metals with cubic space lattice structures belong to this group. In with its dense tetragonal lattice structure can included. (2) Methls that at room temp. have poor plasticity but develop new # slip planes when heated. The plasticity of these metals is greatly increased in certain temp. ranges but the changes also are continuous. All nomomorphic metals with hexagonal lattice structure belong to this group. The drastic increase of plasticity of such metals at elevated temps, can be demonstrated particularly well for Mg at temps, between 300 and lattices is lacking. Metals with rhombohedral and orthorhombic lattices might behave in the same manner, but information on them is lacking. (3) Allotropic metals. For these metals temp. changes are accompanied by changes in the crystal structure. The resulting changes in the phys. properties are severe and discrete. They are most pronounced when the lattice structure changes from one that is unfavorable to plasticity to one that enhances plastic deformation. The high temp, forms of most of the allotrophic methis are of the cubic space lattice type. As a rale, therefore, the highest-temp. forms of an allotropic metal must be the most plastic. This rule can be used: (1) to select the correct addns. to an alloy to stabilize its high temp, crystal structure: (2) to use the best temps for hot-working of allotropic metals; (3) to verify that the high will temp forms of allotropic metals must be of the cubic type, and by the same token, to det. the crystal structures at high temps for those that have not been investigated.









JAVITSKIY YE. M.
USSR/Engineering Ye. Metallography

FD-2618

Card 1/1

: Fub. 41-4/21

Author

Title

: Savitskiy, Ye. M. and Tylkina, M. A., Moscow

+ , +

: The effect of temperature on the plasticity and resistance to

deformation of commercial titanium

Periodical

: Izv. AN SSSR, Otd. Tekh. Nauk 4, 53-57, Apr 55

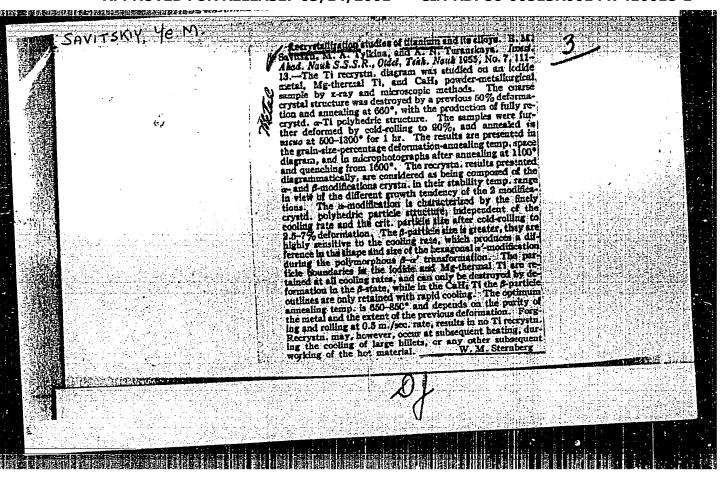
Abstract

Presents the results of an experimental determination of plasticity and resistance to deformation at various temperatures and under various stresses of commercial carbon-free titanium and of titanium with an 0.5-0.8% carbon content. The presence of carbon within this range was found to increase the strength and decrease the plasticity at temperatures of 20-600°. It was found that carbon does not decrease the plasticity of titanium at temperatures of 700-800° and over and permits the hot deformation of titanium under lcw stresses. Graphs. Four USSR references.

Institution

Submitted: February 11, 1955

Translation W-31633, 3 Feb 16



SAVITSKIY, YE.M.

USSR/ Physics - Plasticity

Card 1/1

Pub. 86 - 8/38

Authors

: Savitskiy, Ye. M.

Title

On the plasticity of some brittle metallic substances

Periodical : Priroda 44/7, 60 - 64, Jul 1955

Abstract

Metals which are brittle under ordinary conditions are subjected to experimentation to determine the change in their plasticity under varying conditions, such as changes in temperature and compounding with other elements. Instances are given of brittle metals which become extremely plastic at high temperatures. The study covers the crystal and microstructure of various metals, alloys and other compounds. Illustrations; graph; diagram.

Institution:

Submitted

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

SAVITSKIY YE.M.

USSR/Physics - Netallurgy

Card 1/1

Pub. 22 - 19/51

Authors

. Savitskiy, Ye. M.; Tylkina, M. A.; and Turanskaya, A. N.

Title

Diagram of the recrystallization of iodide titanium

Periodical

Dok. AN SSSR 101/5, 857-859, Apr. 11, 1955

Abstract

A study of the dependence of the magnitude of iodide titanium grains and their degree of deformation on the annealing temperature is described. On the basis of the data obtained, a diagram of recrystallization of iodide titanium was constructed which shows a double modification of iodide titanium crystals: a - hexagonal, and

 β - cubical forms. Graph; illustrations.

Institution : Acad. of Sc., USSR, A. A. Baykov's Institute of Metallurgy

Presented by : Academician I. P. Bardin, January 28, 1955

Savitsky, Ye. M., Tylkina, M. A., "Rhenium and its Alloys."

in book Research on Heat Resistant Alloys, pub by Acad. Sci. USSR, Moscow, 1956, 160pp.

Inst. Metallurgy im A. A. Baykov

SOV/137-57-1-1489

Translation from: Referativnyy zhurnal. Metallurgiya, 1957, Nr 1, p 198 (USSR)

Savitskiy, Ye. M., Tylkina, M. A.

Rhenium and Its Alloys (Reniy i yego splavy) AUTHORS:

PERIODICAL: V kn.: Issledovaniya po zharoprochnym splavam. Moscow, AN

ABSTRACT: The authors investigated the structure and properties of alloys of Re with Mo at different temperatures. The specimens were prepared by the cermet method. Specimens of cast Re were obtained by melting briquettes prepared from powder in an electric-arc furnace in an Ar atmosphere, at 200-mm Hg pressure. Introduction of 1, 3, 5, 10, 25, and 50 weight-% Re does not cause any changes in the microstructure; the Re dissolves in the Mo, and all these alloys have a single-phase structure of a substitution-type solid solution. The alloy with 75% Re is an intermetallic compound, expressed by the stoichiometric ratio MozRe3. With an increase in Re content up to 25-50% the hardness of the alloy increases; the alloy with 75% by weight of Re has the maximum hardness equal to 1120 kg/mm². A lowering of the temperature to -194°C brings about an increase in hardness; raising the

Card 1/2

SOV/137-57-1-1489

temperature causes a decrease in hardness. A 90% Re alloy with a 550-kg/mm² hardness in the 400-hardness at room temperature maintains a 390-340 kg/mm² hardness in the 400-8000 temperature range and 220 kg/mm² at 11500. All specimens except the 75% Re alloy proved fairly ductile. Their compressive $\sigma_b > 200 \text{ kg/mm}^2$. At 10000 all alloys exhibited fair ductility, except for the 75% Re alloy which disintegrated into powder. The 90% Re alloy possesses good ductility both at low and at elevated temperatures. In order to establish whether this alloy can be employed as a heat-resistant material, it should be tested for its stress-rupture properties. A vast amount of material on the physical and mechanical properties of Re is set forth in this work; phase diagrams of alloys of Re with W, Fe, Co, Cr, Mo, and Ni, microstructures of cast Re-Mo alloys, and curves of their hardness and ductility at different temperatures are given. The authors also touched on the problems of the use of Re in the national economy. Ye.K.

Card 2/2

SAVITSKIY, YE M.

137-58-1-1909

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 1, p 256 (USSR)

AUTHORS: Savitskiy, Ye.M., Baron, V.V.

The Hardness and Ductility of Molybdenum-base Alloys (Tverdost' i plastichnost' splavov na osnove molibdena) TITLE:

PERIODICAL: V sb.: Prochnost' metallov, Moscow, AN SSSR, 1956, pp 144-161

ABSTRACT:

An investigation is made into the properties and microstructure of cast Mo alloys with B, Si, Ti, V, Cr, Zr, Nb, Ta, and W added in quantities of 10 and 20 percent, and also of alloys containing up to 0.5 percent Al and up to 0.2 percent C. The specimens were smelted in an electric arc furnace in an Ar atmosphere. Hardness (H) was measured at room and elevated (1150°) temperature, while the ductility of the alloys was determined by upsetting specimens in a press. The H of Mo at 200 is increased 3-4 times by additions of B, Si and Zr. A considerable increase in H is observed on introduction of 15 percent Cr and 1 percent B. Additions of 1-20 percent W do not increase the H of Mo. An insignificant increase in H is observed when V, Nb, and Ti (Ti+1 percent B) is added to Mo. At 11500, the greatest increase in H is observed on addition of B, Si, and Zr to Mo. V, Ta, and Nb also significantly

Card 1/2

137-58-1-1909

The Hardness and Ductility of Molybdenum-Base Alloys

increase the strength of Mo at 1150° . The least effect is caused by Ti and W. At 1150°, the reduction of H is greatest in alloys containing B, Si, Zr, V, and Ta when the content of these elements is up to 10 percent, when the Nb and Cr content is up to 5 percent, and with W up to 20 percent. The alloy containing Ti has the greatest softening effect. Addition of K > 0.2 percent to Mo causes a pronounced reduction in the ductility of Mo, and when there is > 5 percent B, the alloys become embrittled. The ductility of an Mo-Si alloy drops sharply when the Si content exceeds 0.32 percent, and it is zero at 3.5 percent Si. Alloys containing up to 5 percent Ti will take deformation without the appearance of cracks, but higher Ti content (20 percent) renders them brittle. The ductility of alloys diminishes with increasing Cr content (over 0.2 percent to 5 percent Cr), but beyond that it shows little change, while as Nb and Ta increase to 5 percent it increases, after which it undergoes a pronounced drop and is 5 percent at 20 percent Nb, and 24 percent at 10 percent Ta. Specimens containing 15-20 percent V fail under compression. Mo-W alloys will undergo 20 percent deformation without cracks (at 10 percent W and 1 percent B). Bibliography: 16 references. Ye.K.

1. Alloys--Mardness ?. Alloys-Ductility 3. Alloys-Microstructure
4. Alloys--Properties

Card 2/2

E-8

USSR / Structure of Deformed Materials.

: Ref Zhur - Fizika, No 4, 1957, No 9399 Abs Jour

: Savitskiy, Ye.M., Tlylkina, M.A., Turanskaya, A.N. Author

: Investigation of the Recrystallization of Titanium and of Inst its Alloys (I. Diagrams of Recrystallization of Titanium). Title

: Izv. AN SSSR, Otd. tekhn. n., 1956, No 7, 111-114

Orig Pub

: The method of microstructure and X-ray investigation was used to plot volume diagrams for crystallization: (1) For Abstract titanium iodide I at cold rolling and annealing in the in-

terval from 500 -- 1300°. (2) For arc-melted magnesium thermic titanium alloy VT1 -- D of type I in cold deformation by compression and annealing at 500 -- 1400° and of type II in hot deformation by dynamic compression in the range 600 -- 1300° (a) with subsequent annealing and (b) with subsequent annealing, corresponding to the forging temperature. (3) For calcium-hydride metal-ceramic tita-

: 1/2 Card

E-8

USSR / Structure of Deformed Materials.

Abs Jour

: Ref Zhur - Fizika, No 4, 1957, No 9399

Abstract

: nium of type II at hot rolling in the range from 500 --1200° (a) without annealing and (b) with annealing. It was established that owing to the presence of polymorfism and owing to the different ability of the α and $\mathcal C$ modifications to grow grains, each diagram can be considered so to speak as of consisting of two diagrams, corresponding to the temperature regions of the 2 modifications of Ti. The character of the change in the microstructure of titanium as a function of the deformation and heating conditions was shown. The start of recrystallization takes place in titanium iodide at a 50% deformation and 5000, at a 5% deformation and 6000 and in the case of magnesium-thermic titanium the admixtures increase somewhat the recrystallization temperature. In the region of small deformations, from 2.5 to 5%, there exists in the cregion a recrystallization threshold, which is absent from the B-region of the diagram.

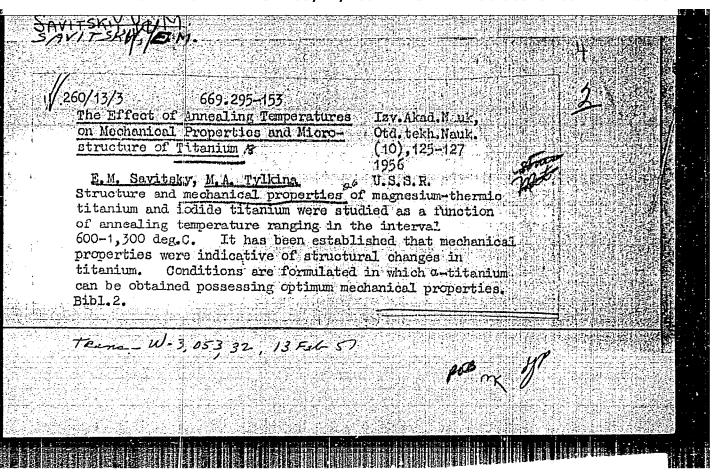
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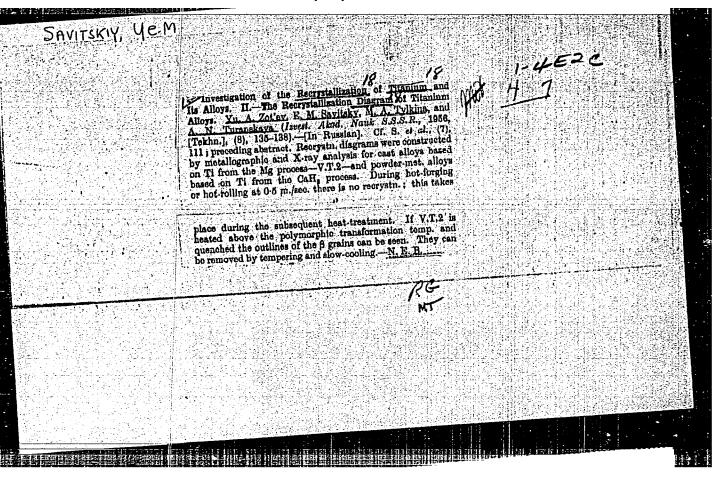
: 2/2

SAVITSKIY, Ye.M., professor, dokter khimicheskikh nauk.

Rare-earth metals. Nauka i zhiza' 23 no.3:63 Mr '56. (MLRA 9:7)

(Barths, Rare)





SAVIISKIY, YE.M

Category: USSR/Solid State Physics - Mechanical Properties of Crystals and

Polycrystalline Compounds

Abs Jour : Ref Zhur - Fizika, No 2, 1957 No 3950

: Savitskiy, Ye.M., Baron, V.V.

Institute of Metallurgy, Academy of Sciences USSR. Concerning the Additiveness of Mechanical Properties of Metallic Alloys Author Tigt

Title and Mixtures.

Orig Pub : Izv. Sektora fiz -khim. araliza IONKh AN SSSR, 1956, 27, 86-96

Abstract : Using the systems Mg-Si, Mg-Ge, Cu-Si, Al-Cu, Ni-Si, and Co-Si as examples, it is show that the mechanical properties of two-phase metallic alloy-mixtures depend substantially on the mutual distribution of the structure of components in these mixtures. The presence of a soft component (for example, a cutectic component), distributed over the boundaries of the solid structure. daries of the solid phase, causes a sharp reduction in the hardness of the alloy. No additive dependence of the properties on the composition is observed in this case. If the soft component is located in the alloy in the form of individual inclusions and if the structure is in general;

broken up the character of the dependence of the properties on the

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Category : USSR/Solid State Physics - Mechanical Properties of Crystals and

Polycrystalline Compounds.

Abs Jour : Ref Zhur - Fizika, No 2, 1957 No 3950

composition is closer to additive. Such a distribution of the components can be obtained if there is a small difference in their melting points (Cu-Al), particularly by hot deformation of cast alloys; if the difference in the melting temperatures is considerable (Al-Si, Mg-Si, Cu-Si), the metal ceramic method is more effective. The mechanical properties of the C. Al alloys at higher temperatures approach additiveness to a greater extent, cwing to the strong softening of the Cu-Al2 compound. In solid solutions based on the Mg-Zn, Mg-Zn, and Mg-Zn, compounds, the hardress also varies linearly with the composition at ordinary and high temperatures

2/2 Card

> APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

SAVITSKIY, YE.M.

USSR/Inorganic Chemistry Complex Compounds, C

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61246

Author: Savitskiy, Ye. M.

Institution: None

Title: Rare Metals

Pele leal: Priroda, 1956, No 4, 24-30

Abstract: None

Card 1/1

USSR/ Physics - Technical physics

Card 1/1

Pub. 22 - 22/54

Authors

: Savitskiy, Ye. M.; Tylkina, H. A.; and Turanskaya, A. N.

Title

Mechanical properties of iodide titanium

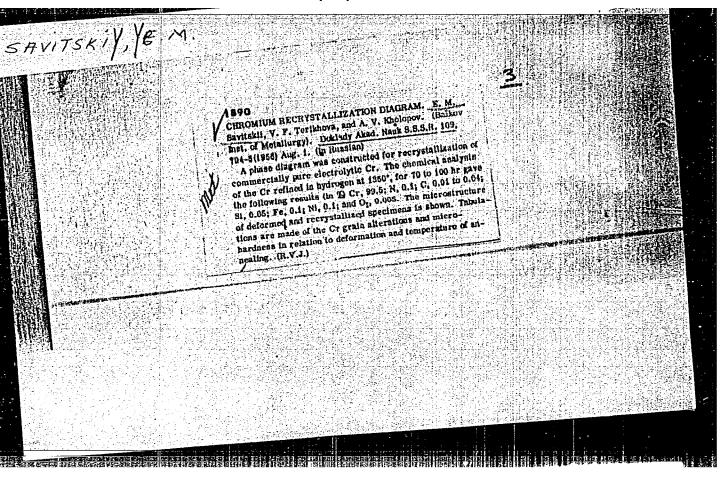
Periodical : Dok. AN SSSR 106/2, 254-257, Jan 11, 1956

Abstract -

An experimental study of the mechanical properties of metallic titanium (iodide titanium) is presented. The experiments were conducted to determine the effect of temperature on the durability, plasticity and other mechanical characteristics of iodide titanium. Ten references: 5 USA, 5 USSR (1953-1955). Illustrations; graphs; tables.

Institution:

Presented by: Academician I. P. Bardin, July 11, 1955



MOGUCHIY, Leonid Nikolayevich; SAVITSKIY, v. M., otvetstvennyy redaktor;
PINKHUSOVICH, L.L., redaktor isdatel stva; ZEMLYAKOVA, T.I.,
tekhnicheskiy redaktor.

[Working metals under pressure] Obrabotka metallov, davleniem.
Moskva, Izd-vo Akad, nauk SSSR. 1957. 198 p. (MIRA 10:4)
(Metalwork)

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

SAVITSKIY Yewgeniy Mikhaylovich; AGEYEV, N.V., otvetstvennyy redaktor;
MINHEL'SON, E.M., redaktor izdatel'stva; KISELEVA, A.A., tekhnicheskiy redaktor.

[Effect of temperature on mechanical properties of metals and alloys] Vilianie temperatury na mekhanicheskie svoistva metallov i splavov. Moskva, Izd-vo Akad.nauk SSSR, 1957. 294 ps. (MIRA 10:6)

1. Chlen-korrespondent AN SSSR (for Ageyev, May) (Metals, Effect of temperature on)

137-58-4-3-

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 278 (USSR) The Influence of Temperature on the Mechanical Properties of AUTHORS: Savitskiy, Ye.M., Terekhova, V.F.

Cobalt (Vliyaniye temperatury na mekhanicheskiye svoystva TITLE:

PERIODICAL: Tr. In-ta metallurgii. AN SSSR, 1957, Nr 1, pp 153-157 A study was made of the hardness, strength, and plastic

ABSTRACT:

properties of Co under tensile and compressive stresses, also properties of Oo under tensile and compressive stresses, also of its ak, at temperatures of 20-1200°C. The specimens were of its ak, at temperatures of arade K-2 coholt in a high fremelting a grade K-2 coholt in a high fremelting a prepared by remelting a grade K-2 cobalt in a high-frequency furnace, whence it was suction-drawn into porcelain tubes [1] lurnace, whence it was suction-drawn into porcelain tubes 1112 mm in diameter. The hardness was measured in the 50-1000 range by means of a unobedity constant of the successful cons 12 mm in diameter. The hardness was measured in the 50-100 range by means of a "pobedit" cone loaded with an indentation force of 100 kg. Static compression was averted in a hidraulic force of 100 kg. Static compression was exerted in a hydraulic press until the first cracks appeared. Specimens 3 mm in dipress until the first cracks appeared. Specimens 3 mm in di-ameter were tensile-tested in a Gagarin testing machine. The ak ameter were tensue-tested in a Gagarin testing machine. Ine ak value was determined for specimens 10 mm in diameter bearing value was determined for specimens found that the rate of decision of the case of the value was determined for specimens 10 mm in diameter beari circular notches 2 mm deep. It was found that the rate of decrease in Co hardness from 187 kg/mm2 (for temperatures in crease in Co hardness from 187 kg/mm2) circular notines 2 mm deep. It was found that the rate of decrease in Co hardness from 187 kg/mm² (for temperatures up

Card 1/2

137-58-2-4224

The Influence of Temperature on the Mechanical Properties of Cobalt

to 20°) to 15 kg/mm² (at 1100°) abruptly steepened in the 300-450° range. Under compression, σ_b declined moderately (up to 450°), then (in the region of β -Co) it increased noticeably, accompanied by a change from brittle to ductile fracture. The magnitude of σ_b dropped from 13 kg/mm² at 20° to 1.4 kg/mm² at 800°; δ increased by 3%. Reduction in area (necking) increased until the temperature reached 400°, but then diminished as the temperature rose further. The ak-versus-temperature curve had two maxima, at 350° & 500°, with a min. at 400°. A hypothesis is advanced to the effect that the abrupt change in the mechanical properties of the Co in the 350-450° temperature range is linked to its polymorphous transformation.

1. Cobalt - Mechanical properties -- Temperature effects

Card 2/2

The toking leader.

137-1957-12-25299

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 334 (USSR)

Savitskiy, Ye. M., Tylkina, M. A. AUTHORS:

Mechanical Properties of Cast Rhenium (Mekhanicheskiye TITLE:

svoystva litogo reniya)

PERIODICAL: Tr. In-ta metallurgii. AN SSSR, 1957, Nr 1, pp 158-161

Castings of Re to be investigated were obtained by melting sintered powdered metal in an argon-arc furnace. Hardness ABSTRACT: tests, conducted in the temperature range between -194° and +1150°, showed that H_k varies from 400 kg/mm² to 134 kg/mm², respectively. Plasticity was determined at 20° and 1000°. At 20° and a compressive of 200 kg/mm², the compression was 25-30 percent. At 1000° the compression was 60 percent. Cold working increases the hardness by approximately 80 percent. Recrystallization begins at approximately 15000.

Bibliography: 7 references.

P. N.

Card 1/1

Rhenium castings-Mechanical properties-Test results

SOV/124-58-4-4851

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr4, p163 (USSR)

Savitskiy, Ye. M., Terekhova, V.F. AUTHORS:

Temperature Effect Upon Mechanical Properties of Alkaline-TITLE:

earth Metals (Vliyaniye temperatury na mekhanicheskiye

svoystva shchelochnozemel' nykh metallov)

Tr. In-ta metallurgii. AN SSSR, 1957, Nr 1, pp 162-169 PERIODICAL:

Experimental investigations as to the effect of temperature on the hardness, strength, and ductility under tension were ABSTRACT:

performed on specimens of metallic magnesium, calcium, strontium, and barium. Experiments were carried out in an atmosphere of argon on specially constructed testing installations suitable for samples of limited dimensions. The results showed that the samples investigated were graded in the following order according to decreasing hardness and strength and increasing ductility: magnesium, calcium, strontium, and barium. With an increase in temperature all of the metals softened quickly and at 500-550°C the strength and hardness

became comparable.

1. Alkaline earths--Mechanical properties From the résumé Card 1/1

2. Alkaline earths -- Temperature effects

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

SAVITSKIY, YE.M.

137-58-5-10599

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 5, p 248 (USSR)

Savitskiy, Ye.M., Trapeznikov, V.A. AUTHORS:

Evaluating the Transition of Chromium From the Brittle to the Ductile State (K voprosu ob otsenke perekhoda khroma iz khrup-TITLE:

kogo sostoyaniya v plastichnoye)

V sb.: Issled. po zharoprochn. splavam. Vol 2. Moscow. PERIODICAL: AN SSSR, 1957, pp 141-147

A study is made of the possibility of determing the temperature of Cr transition from the brittle to the ductile state by ABSTRACT: static testing for compression along a single axis and by measurement of hardness. A design of a device for hot tests for static monoaxial compression is presented. The experiments were run with electrolytic Cr, reduced in a current of dry and purified H2 and then resmelted in a current of technical Ar in an induction furnace. Experiments were also run with industrial aluminothermic Cr, resmelted in similar fashion in a current of technical Ar. It is established that in an interval ranging from room temperature to 250°C for electrolytic Cr and to 300° for aluminothermic Cr, the ductility (D) changes insignificantly,

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CIA-RDP86-00513R001447410018-1"

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137-58-5-10599

Evaluating the Transition of (cont.)

and in this temperature interval Cr displays brittle failure (F). At temperatures of N250° and 300°, depending upon the degree of purity, Cr reveals a sharp transition from a region of brittleness to a state of ductility, terminating at about 400°, after which a gradual smooth rise in D is observed and the metal exhibits ductile F. It is shown that the purer the Cr and the higher the temperature and lower the time rate of elongation applied to the metal, the greater its D and the lower the temperature of transition from the brittle to the plastic state. Hardness tests showed that the hardness method also affords a fairly precise determination of the temperature at which the transition of Cr to the region of ductile F terminates and an evaluation of the influence of the level of purity of the metal upon its D on heating.

1. Chromium--Phase studies 2. Temperature--Determination

Card 2/2

SOV/137-58-7-15957

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 289 (USSR)

Savitskiy, Ye.M., Terekhova, V.F. AUTHORS:

Investigation of the Mechanical Properties and Construction of the Diagram of the Recrystallization of Chromium (Issledo-TITLE: vaniye mekhanicheskikh svoystv i postroyeniye diagrammy

rekristallizatsii khroma)

PERIODICAL: V sb, Issled. po zharoprochn. splavam. Vol 2. Moscow,

AN SSSR, 1957, pp 148-157

The effect of temperature on the hardness, plasticity, and strength during stretching and compression and also the ak ABSTRACT:

of Cr of various grades of purity, namely, hydride (98.5%), aluminothermic (98, 9%) and electrolytic (99, 5%) was investigated. Aluminothermic Cr has the greatest hardness at room temperature. Its ob is 4.7 kg/mm, while that of the electrolytic Cr is 17 kg/mm². The critical point of the brittleness of Cr depends upon its purity. Upon compression the aluminothermic Cr is transformed from the brittle state into the malleable at 300°C; the electrolytic Cr is similarly transformed at 200-250°. Upon a rise of temperature Cr

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SOV/137-58-7-15957

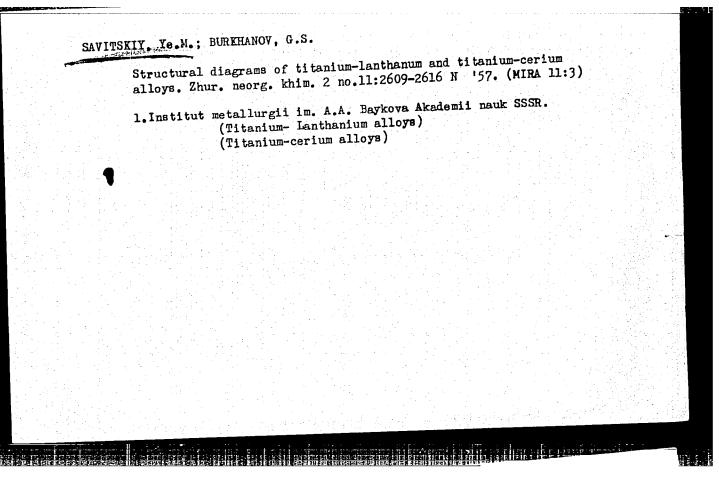
Investigation of the Mechanical Properties and Construction (cont.)

softens considerably. During the transition into the plastic state a certain increase in hardness is observed in Cr of all types at 350-450°. At 1000° electrolytic Cr subjected to monoaxial compression can withstand a singlestroke 90% upsetting without failure. In the 500 to 700° range impact specimens without a notch do not break but bend plactically. In this temperature range Cr can be worked by pressure. A specific characteristic of Cr is its increase in strength with a rise in temperature. This is especially true for impure Cr. The σ_b of aluminothermic Cr increases from 4.7 at 20° to 10 at 1100°, that of electrolytic Cr from 17 at 20° to 28 kg/mm at 500°. X-ray investigations showed that the increase in the strength of Cr in the 300-500° range is not related to the appearance of a new crystalline modification of Cr. A diagram of the recrystallization of Cr, constructed with the help of microstructural and X-ray methods and by measurement of microhardness, is adduced. Full recrystallization of Cr. occurs at 1020°. The hardness and the ductility of Cr after recrystallization do not decrease; the temperature of the transition of Cr from the brittle into the ductile state upon compression is decreased by 30-50°/o. 1. Chromium--Physical properties 2. Chromium--Crystallization 3. Chromium--Temperature

factors

Card 2/2

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"



SAVITSKIY

62-12-15/20

AUTHORS:

Shostakovskiy, M.F., Savitskiy, Ye.M.,

Kochkin, D.A., Musatova, L.V.

TITLE:

On the Comparative Efficiency of Silicon Alloys With Copper and Nickel, Applicable in Direct Synthesis of Vinylchlorosilanes (O sravnitel'noy effektivnosti splavov Kremniya s med'yu i nikelem, primenyayemykh v pryamom sinteze vinilkhlorsilanov).

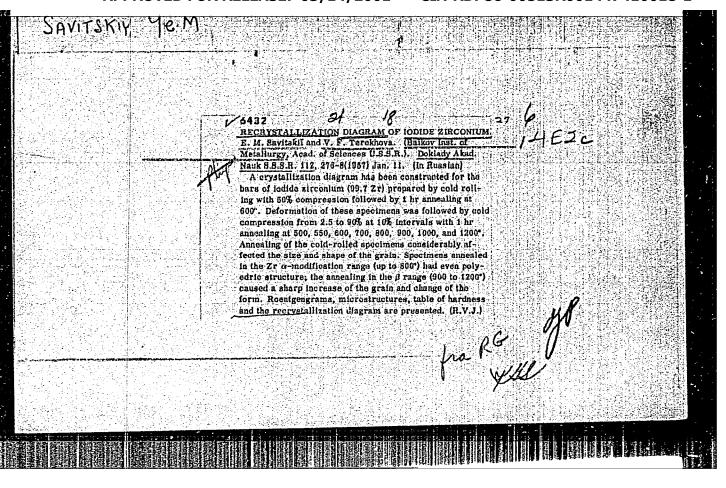
PERIODICAL:

Izvestiya AN SSSR OtdeleniyeKhimicheskikh Nauk, 1957, Nr 12, pp. 1493-1495 (USSR)

ABSTRACT:

In the course of a thorough analysis of the alloy of silicon with copper (which was already previously described) the authors, among other things, found that the alloy contained 50% silicon, 49% copper, and 0.4% aluminum. Also silicon alloys were investigated which contained also other metals such as chromium, manganese, and molybdenum. In other cases (with the exception of nickel and copper) negative results were obtained. From the result of the synthesis (see table) it may be seen that the silicon-nickel alloy is more active (when vinylchloroilanes are obtained by direct synthesis). It was further shown that the silicon-nickel alloy (nickel content 15%) must be considered to be the most suitable. There are 1 table, and

Card 1/2



YE.M. SAVITSKIX

SAVITSKIY Ye.M., BARON V.V., IVANOVA K.N.

20-5-35/67

AUTHOR TITLE

ABSTRACT

Diagram of Molybdenum Recrystallization.

(Diagramma rekristallizatsii molibdena -Russian)

Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 5, pp 1070-1072(U.S.S.R.)

PERIODICAL Received 7/1957

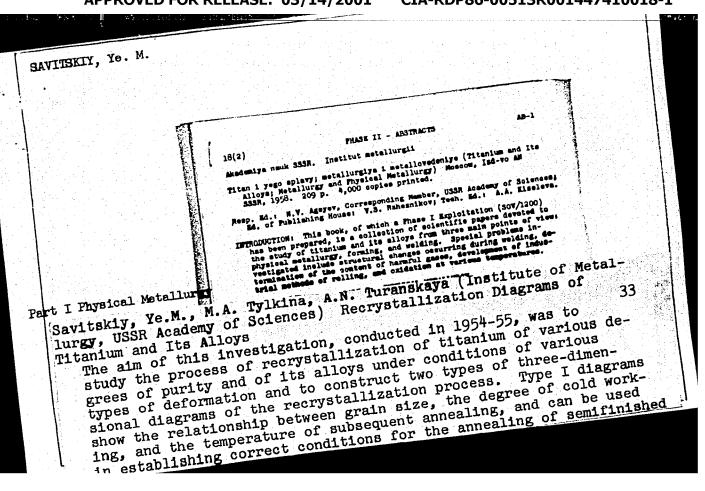
Apart from other factors, the size of grain is known to influence the mechanical properties of metals. In the case of molybdenum this manifests itself with particular clearness. A brittle and coarse-grained structure can be rendered more fine and uniform by a suitably selected heat treatment. In this way the material becomes more plastic and is better suited for cold treatment. Therefore the setting up of a recrystallization diagram for molybdenum, which contains the size of grain, degree of degree of deformation, and annealing temperature, is of particular interest. As hitherto this problem had been but little investigated, the authors carried out therecrystallization of molybdenum of the first type. In order to obtain a uniform, fine initial structure, the material was several times forged at from 1600 to 12000. The total degree of deformation amounted to 96%. As a result of this treatment the very coarse and uneven structure disappeared. Forging at low temperatures led to the formation of texture. After annealing in the vacuum at 130° the samples had a polyhedric fine-grained structure with an average size of grain of about 22. - 25 . On the strength of these results it may be assumed that the hot for-

Card 1/2

"Recrystallization Diagrams of Titanium and Its Alloys," with TYLKINA, M. A., and TURANSKAYA, A. N., Titan i yego splavy; metallurgiya i metallovedeniye (Titanium and Its Alloys; Metallurgy and Physical Metallurgy), Moscow, Izd-vo AN SSSR, 1958. p 33

(Institute of Metallurgy, USSR Acad. Sci.)

"Mechanical Properties of Titanium of Various Degrees of Impurity," p 68., Ibid. (co-authors same as above).



AB-1

Titanium and Its Alloys (Cont.)

2.在主题中的 18.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 19.10 1

and finished products. Type II diagrams illustrate the relationship between grain size, degree of hot deformation, and temperature of hot deformation; they are useful in establishing optimum conditions for the forming of metals and for obtaining the desired properties in semifinished and finished products. Before the present investigation no such diagrams had been published. A study was made of the recrystallization of three types of pure titanium: (1) iodide-derived; (2) magnesium-reduced (type VT-1D), melted in an arc furnace; and (3) CaH2-reduced, sintered (type IMP-1). Similar studies were made for VT-2 titanium-aluminum-chromium alloy and for IMP-3 alloy (CaH2-reduced titanium with an addition of chromium. Diagrams of Types I and II for recrystallization under conditions of rolling and forging were established by methods of microscopic and x-ray analysis. Conclusions. 1) The following recrystallization diagrams were constructed: a) Type I for iodide-derived titanium with deformation by means of rolling; b) Type I, with deformation by static compression, and Type II, with deformation by smith forging, for technical Mg-reduced, fused, and hotrolled titanium (type VT-lD); c) Type II, with deformation by smith forging, for VT-2 alloy; d) Type II, with deformation by hot rolling, for IMP-1 titanium; Card 10/43

Titanium and Its Alloys (Cont.)

AB-1

e) Type II, with deformation by hot rolling for IMP-3 alloy. Because of the polymorphous character of titanium and the different capacities of the alpha and beta forms for grain growth, the recrystallization diagram should be thought of as consisting of two parts corresponding to the temperature ranges in which the alpha and beta forms exist. The alpha phase of Ti is characterized by a finegrained polyhedral structure, and insensitivity to the rate of cooling after annealing, and the existence of a critical grain size after cold deformation of 2.5-7 percent. The beta modification is distinguished by a large grain size and high sensitivity to the cooling rate, a consequence of which is the different shape and size of the grains in the hexagonal modification (a!) appearing as a result of the polymorphous transformation of beta titanium in cooling. In iodide-derived and commercial titanium the boundary contours of the beta grains are preserved, no matter what the cooling rate, and can be destroyed only by deformation in the alpha phase. The contours of the beta grains in CaH2-derived Ti and in VT-2 alloy 4) In the stable temperacan be preserved only by rapid cooling. ture range of the beta phase there were no indications of a recrystallization threshold or a maximum corresponding to critical degrees of deformation. This is probably due to the fact that Card 11/43

Titanium and Its Alloys (Cont.)

AB-1

structural changes caused by small plastic deformations in the alpha temperature range are erased by the structural changes developing as a result of the polymorphous transformation $\sigma \rightleftharpoons \beta$ in titanium. 5) The optimum annealing temperature for obtaining alpha titanium of polyhedral structure falls within the 650-850°C range, depending on the purity of the metal and the extent of the previous deformation. More exact indications as regards the annealing temperature regime for each degree of deformation can be obtained by referring to the recrystallization diagrams. 6) Under conditions of smith forging and rolling at the rate of 0.5 m/sec, recrystallization in commercial titanium does not have time to go to completion. However, recrystallization may still set in with subsequent heating, or during the cooling of large blanks, or in further working of the still hot material. For this reason, the danger of the development of a coarse-grained structure, especially in the case of small deformations, should always be kept in mind. There are 22 figures, 5 tables, and 11 references (8 Soviet, 1 Engligh, 1 German, and 1 Japanese).

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Titanium and Its Alloys (Cont.)

AB-1

Savitskiy, Ye.M., M.A. Tylkina, A.N. Turanskaya (Institute of Metallurgy, USSR Academy of Sciences) Mechanical Properties of Titanium of Various Degrees of Purity The aim of this investigation, conducted in 1954-55, was to determine the mechanical properties of titanium produced by various methods and studied under different conditions of temperature and stress. The materials tested were: (1) iodide-derived Ti; (2) sintered Mg-reduced Ti; (3) Mg-reduced Ti melted in an induction furnace in graphite crucibles (0.5-0.8 percent C); (4) Mgreduced Ti melted in an arc furnace with tungsten electrodes (VT-1D commercial Ti, contaminated with W); (5) sintered CaH2reduced T1; (6) cast VT-2 T1-base alloy, with additions of 2-3 percent of Cr and 1-2 percent of A1; (7) sintered alloy of CaH2 reduced Ti base, with addition of Cr. Tests were made for the following mechanical properties: hardness, strength, and ductibility under compression and tension, and impact toughness. The effect of temperature on the properties was tested in the range extending from -196° to +1100° C in vacuum, argon, and air. Cooling to -196° was accomplished with the use of liquid nitrogen. Hardness was determined by producing an indentation with a pobedite Card 13/43

Titanium and Its Alloys (Cont.)

AB-l

cone with a load of 100 kg, (for iodide-derived Ti, 15 kg) in a temperature range of -196° to +1000° C (in a current of argon when the specimens were heated above 400° C). Conclusions. 1) The detent of purity as determined by the method of preparing titanium materials. Of the metal Todide materially affects the mechanical properties of the metal. Iodide derived Ti of very high purity exhibits considerable ductibility (deformation of up to 95 percent in cold rolling) and withstands bending at an angle of < 180° without breaking, even at -196°. Its hardness was the lowest of any of the materials tested: 132 kg/mm². Conness was the lowest of any of the materials tested: 132 kg/mm². tamination of the metal greatly increases its hardness (from 132 to 330 kg/mm?) and its strength from 25 to 100 kg/mm?), as a result of the decrease in ductility and impact toughness. The relative hard-ness at 20° C of five of the materials tested is shown in the following sequence (materials arranged in ascending order of hardness): iodide titanium; VT-ID commercial Ti, Mg-reduced (W-contaminated); CaH2-reduced Ti, Mg-reduced Ti, melted in graphite crucibles (0.5-08) percent); VT-2 alloy. Differences in the properties of Ti containing 0.53-0.82 percent of C were practically undetectable. 2) Titanium is highly sensitive to the rate of deformation. An increase in the rate causes a sharp drop in ductility characteristics. 3) Lower-in the temperature to -196° increases the strength and decreases Card 14/43

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Titanium and Its Alloys (Cont.)

AB-1

the ductility of all types of titanium. An increase in temperature brings about a rather intensive softening and a loss in strength of Ti of all types. Above 600° the difference in the mechanical properties of all types of Ti evens out, and the effect of impurities levels off. In deformation at a low rate of speed in the neighborhood of 700° the strength-reducing effect of recrystallization also begins to be seen. After a polymorphous transformation in the beta phase, titanium of all types becomes very ductile, having an extremely low resistance to deformation. 4) The mechanical properties are a sensitive indicator of structural changes taking place in titanium as a result of heat treatment. Heating of titanium of all types at temperatures above 1000° always leads to a preservation of beta-phase grain contours after cooling and transition to the alpha phase and considerably lowers the mechanical properties, especially ductility. Heating regimes in deformation and annealing were established, making it possible to obtain an alpha titanium of fine-grained polyhedral structure having optimum mechanical properties. There are 10 figures, 3 tables, and 14 references (8 Soviet and 6 English).

Card 15/43

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

TSKIY, Ye.M.; TYLKINA, M.A.; TURANSKAYA, A.M. Titanium and titanium alloy recrystallization diagrams. Titan i (MIRA 14:5) ege splavy no. 1:33-67 '58.										
l. Institut metallurgii AN SSSR. (Titanium—Metallography)	(Crystallization)									

SAVITSK	(IY, Ye.M.;	TYLKINA,	M.A.; TUF	anskaya, a.n.										
- magazina	ege splavy	operties C	of varying	degree purity	titanium. Titan (MIRA 14:5)									
1.	. Institut m (Titani	etallurgi: um-Metal	AN SSSR. Lography)	(Deformations	(Mechanics))									

30-2-42/49 Savitskiy, Ye. M., Boctor of Chemical Sciences

Terekhova, V. F., Candidate of Technical Sciences AUTHORS:

Investigation of the Alloys of Rare Metals (Issledovaniye splavov TITLE:

redkikh metallov) All-Union Conference (Vsesoyuznoye soveshchaniye):

Nr 2, pp 111-112 Vestnik Akademii Nauk SSSR, 1958, PERIODICAL

(USSR)

On November 18 - 20, 1957, an All Union Conference was called by ABSTRACT:

the Institute for Metallurgy imeni A. A. Baykov of the AN USSR and the Board for Rare Metals at the Scientific Technical Committee of the Cabinet Council of the USSR. The conference was attended by representatives of scientific research institutes, universities and industry. Reports on raw material sources of rare metals and their production in pure state, problems of scientific investigations of alloys of rare metals, investigation results of alloys of various systems, their physical chemical properties and industrial application were delivered and discussed. Serious shortcomings hindering the development of research were pointed out. Above all, the intensification of the production of pure rare metals was demanded. The determination of the

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30-2-42/49

Investigation of the Alloys of Rare Metals. All Union Conference

constants of physical chemical properties of pure rare metals and their alloys has to be regarded as the least investigated which hinders its rational introduction into political economy. Also systematical work in this field is carried out insufficiently. There is also a lack of information in this field; no special periodical exists. The importance of the ascertainment of new metals with addition of rare metals for the new technica was stressed. Research work must be considerably extended and carried out more quickly. For this work also the institutions of the AN JSSR and their subsidiaries, the academies of the Republics of the Union, branch institutes, universities, and laboratories must join. The Institute for Metallurgy was charged with the coordination of the work. The resolution was also made to carry out the work methodically so as to shorten the necessary time and to reduce the expenses of research work. Equally the demand for an own periodical was expressed.

AVAILABLE:

Library of Congress

3. Scientific 2. Rare metals-Alloys 4. Metallurgy-USSR 5. Rare metals-1. Rare metals-Sources research-Rare metals Production

Card 2/2

7 V17 SK15, 40 M.

24-58-3-11/38

AUTHORS: Savitskiy, Ye.M., Tylkina, M.A., Tsyganova, I.A. (Moscow)

Influence of Alloying Additions on the Recrystallization Tempe-TITLE:

rature and on the Mechanical Properties of Titanium. (Vliyaniye legiruyushchikh dobavok na temperaturu rekristalli-

zatsii i mekhanicheskiye svoystva titana)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Mauk, 1958, Hr 3, pp 96-103 and 1 plate (USSR)

This paper is a continuation of earlier work of the authors and their team on the recrystallization and the mechanical properties of Ti of various degrees of purity and of Ti alloys (Refs.1-6). Reinbach and Nowikow (Ref.7) published preliminary data on the influence of certain additions ABSTRACT: (up to 1%) on the change in the time required to attain complete recrystallization of commercial Ti at a given annealing temperature; they found that introduction of chromium slows down the process of recrystallization whilst other admixtures (Co, Al, Fe. Ta and Sn) showed almost no influence on the duration of attaining complete recrystallization. In this paper an attempt is made to classify the alloying elements from the point of view of their influence on the recrystallization temperature and the mechanical properties whereby these characteristics are considered as a function of the character

Card 1/5

24-58-3-11/38

Influence of Alloying Additions on the Recrystallization Temperature and on the Mechanical Properties of Titanium.

of the interaction of Ti with the alloying additions, their crystal structure and also the temperature of polymorphous transformation. The relations published by Bochvar (Ref. 8) and by Kurilekh (Ref.9), interrelating the recrystallization temperature of metals with their fusion temperature, are not applicable to alloys. The complexity of diffusion processes in solid solutions, the differing character of these solutions and the presence of second phases in the alloys are all factors which complicate the process of recrystallization. important factor which has not been taken into consideration so far is the presence in metals or allcys of the phenomenon of polymorphism. In the view of the authors of this paper, in metals and alloys in which polymorphous transformation takes place, the recrystallization temperature should be closely linked with the temperature of the polymorphous transformation in addition to the influence of other factors. It is obvious that in alloys in which such transformation takes place all the recrystallization processes are fully completed in the range of existence of lower temperature

Card 2/5

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24-58-3-11/38

Influence of Alloying Additions on the Recrystallization Temperature and on the Mechanical Properties of Titanium.

modifications (particularly α modification in Ti) and when the temperature of polymorphous transformation is reached, phase recrystallization and reconstruction of the crystal lattice is already proceeding. The experiments were carried out with an iodide Ti of 99.96% purity alloyed with additions of the following 14 elements: V, Nb, Fe, Co, Mn, Cr, N, C, O, Al, Be, Pe, Sn, and Berson, For acch of the cilcumstance of the control of the control of the control of the control of the cilcumstance of th O. Al. Be, Re, Sn and Boron. For each of the alloying additions, 4 to 5 alloys were prepared and the content of each of the additions in the alloy was chosen in such a way that alloys were obtained which are located in various phase ranges of the system, namely, alloys possessing uniform α and β structures, 2-phase α + β or α + chemical compound structures. The compositions of the alloys are entered in the table on Graphs are included showing the influence of the annealing temperature on the hardness, the influence of the alloying additions on the recrystallization temperature, on the ultimate strength, elongation and contraction. It was found that almost all of the investigated alloying additions bring about an increase in the recrystallization temperature. As regards the degree of their influence these elements can Card 3/be subdivided into the following three groups: elements which

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24-58-3-11/38

Influence of Alloying Additions on the Recrystallization Temperature and on the Mechanical Properties of Titanium.

bring about a considerable increase in the recrystallization temperature at low contents of the respective element (N, O, C, Boron, Be Re and Al); elements which bring about an o, boron, he ke and Al); elements which oring about an increase in the recrystallisation only if the content is of the order of 3% and higher (Fe, Cr, V, Mn, Sn); elements which have practically no influence on the initial recrystallization temperature (Nb and Co). The following relation was derived between the recrystallization temperature, T1 and the tem- T_2 , of the perature of the polymorphous transformation, alloy: $T_1/T_2 = 0.7$; 0.9, For Ti this ratio equals 0.71, for low alloy alloys this ratio equals 0.7 - 0.75 and increases to 0.8 - 0.9 with increasing contents of the alloying element. The alloying additions bring about an increase in the tensile strength and hardness, maximum values being $\sigma_B = 92 \text{ kg/mm}^2$ The great- $R_B = 105$ and a reduction in the ductility. est influence is exerted by elements which bring about a maximum increase in the recrystallization temperature and

Card 4/5

24-58-3-11/38

Influence of Alloying Additions on the Recrystallization Temperature and on the Mechanical Properties of Titanium.

belong to the first of the above-mentioned group, i.e., N, O, occasing the strength and for a content of 5% these on increasing the strength and for a content of these of increasing the classified from the point of view of increaselements can be classified from the point of view of increasing the strength in the following sequence: Cr, Co, Nb, V, ing the strength in the strength in the stren

SUBMITTED: April 5, 1957.

Card 5/5 lization 3. Temperature Effects

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

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78-3 3-37/47

AUTHORS:

Terekhova, V. F. Savitskiy, Ye. M.,

TITLE

The Phase Diagrams of the Alloys of Lanthanum With Cerium and Lanthanum With Calcium (Diagrammy sostoyaniya splavov lantana s tseriyem i lantana s kalitsiyem)

PERIODICAL;

Zhurnal Neoganicheskoy Khimii, 1958, Val. 3, Nr. 3, pp. 756-762 (USSR)

ABSTRACT:

The phase diagrams of the alloys of lanthanum with cerium, and lanthanum with calcium were investigated by thermal analysis, and by the determination of microstructure, hardness and electric resistance, and the diagrams were constructed. In the system lanthanum-cerium purest metallic cerium with 97 - 99 % purity and lanthanum with 98,5 % purity were used. Lanthanum and cerium dissolve in a liquid and solid state and form a diagram with unlimited solubility. In the system lanthanum calcium the initial metals were molten in a vacuum under an argon atmosphere. The produced alloys were investigated by the determination of mic rostructure and the analyses showed that in a solid state a layer formation is to be

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APPROVED FOR RELEASE: 03/14/2001

CIA-RDP86-00513R001447410018-1"

78-3-3-37/47

·The Phase Diagrams of the Alloys of Lanthanum With Cerium and Lanthanum

With Calcium

noticed. The thorough investigation by the microstructure determination showed that in a solid state more than two layers occur. The occurrence of two layers in the alloys can already be observed at a calcium content of more than 12 - 15 %. With an increase in the calcium content to 30-60 % the thickness of the outer layer highly increases. By the chemical analyses the determination of the specific weight and the hardness of the layers it was found that the upper layer consists of calcium and the lower one of lanthanum. The alloys with about 1 % calcium consist of a phase of solid solution. The alloys with 60 - 80 % calcium have three layers of which the middle one is of polyhedral structure and is rich in calcium. The sclubility of lanthanum in calcium and of calcium in lanthanum at an eutectic temperature of 705°C is not higher than 3 .. 5 %. There are 15 figures, 4 tables, and 8 references, 3 of which are Soviet.

ASSOCIATION 8

Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Metallurgical Institute imeni A. A. Baykov, AS USSR)

SUBMITTED:

June 10, 1957

Card 2/2

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

FERRICA DE LA COMPANION DE LA

78-3 3-38/47

AUTHORS:

Baron, V. V. Tylkina, H. A. Savitskiy, Ye. M.,

TITLE:

The Phase Diagrams and Properties of Gallium and Thallium Alloys (Diagrammy sostoyaniya i svoystva splavov galliya i

talliya)

PERIODIC AL:

Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp.763-775

(USSR)

ABSTRACT:

The structural and physico-mechanical properties of the alloys ofgallium with silicon and germanium in all concentrations as well as of gallium with antimony, manganese, copper and thallium with lanthanum were investigated. The phase diagram of gallium with silicon is of an autectic type. All alloys consist of two phases. The eddition of silicon to gallium highly increases the hardness and the electric resistance of silicon. The phase diagram of gallium and germanium also is of an eutectic type. The eutectic composition melts at 290C and has a gallium content of 99,45 %. All alloys of this system possess

Card 1/3

The structure and the properties of the alloys of gallium and

78-3 3 38/47

The Phase Diagrams and Properties of Gallium and Thallium Alloys

antimony were examined for hardness, microhardness, plasticity, strength and electric resistance between 20 and 600°C. Alloys with 63,59 - 64,08 % antimony at room temperature have a maximum electric resistance which decreases with a rise of temperature. This proves that these alloys possess properties of semiconductors. The structure and the properties of the alloys of gallium with 50 86,3 % gallium were examined by microstructure, hardness, strength, microhard. temperatures of 20.300°C. The following compounds occur in the alloys MgGa and Mg_Ga2. ness and electric resistance at Alloys in the domain of the compound MgGa show the highest hardness and the smallest strength and plasticity. The system gallium-copper with 15 .. 85 % gallium was also investigated for microstructure, hardness, strength, microhardness and electric resistance. The results showed that by the addition of gallium to copper hardness, strength and electric resistance increase, but that the plastic ty decreases. The electric resistance of the alloys increases with a rise of temperature. The phase diagrams and the properties of the alloys of gallium with germanium, sallium with silicon and gallium with lanthanum were also investigated. Alloys between silicon and thallium do not occur. In the system lanthanum-

Card 2/3

78-3 3-38/47

The Phase Diagrams and Properties of Gallium and Thallium alloys

-thallium the compound La T1 occurs which possesses an high electric resistance and an high hardness. There are 15

figures and 19 references, 0 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova, Akademii nauk SSSR

(Metallurgical Institute imeni A. A. Baykov, AS USSR)

June 25, 1957 SUBMITTED:

Card 3/3

78-3-3-46/47

AUTHORS:

Savitskiy, Ye. M., Tylkina, M. A.

TITLE:

Alloys of Rhenium With High-Melting Metals (Mo, Ti, Zr, Ta, Ni, Co, Cr, W, Mn) (Splavy reniya s tugoplavkimi metallami

(Mo, Ti, Zr, Ta, Ni, Co, Cr, W, Mn))

PERIODICAL:

Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 820-836

(USSR)

ABSTRACT:

The investigations were performed with different physico--chemical methods, especially by the determination of the melting point. On the basis of these investigations the nature of the alloys in the case of the influence of rhenium upon high-melting metals was determined. The modification of the hardness, the melting point and the electric resistance in this system was observed. In the system Ti-Re a larger solubility domain of rhenium in B-titanium was determined. On the intro duction of 15% rhenium the \$-phase of titanium is stabilized. In general the addition of rhenium to titanium increases the thermal stability. In the system Mo-Re solid solutions occur. At a temperature of 2570°C an O-phase occurs by peritectic reaction. The boundary of the

Card 1/3

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

78-3 3-46/47

Alloys of Rhenium With High-Melting Metals (Mo, Ti, Zr, Ta, Ni, Co, Cr, W,

Mn)

solid solutions of rhenium in molybdenum was not exactly determined. In the system Ta-Re in the case of 60 - 70 % rhenium the compound ${\rm Re}_2{\rm Ta}_2$ was determined. On addition of 60 \sim 80 % rhenium the alloys in this system are brittle and breakable. In the system Co-Re an uninterrupted series of solid solutions with an hexagonal crystal lattice between &-cobalt and rhenium was determined. In the system Ni-Re solid solutions of rhenium in nickel (comphase) occur and solid solutions of nickel in rhenium (β -phase). The boundary between these two phase domains lies at 1200°C in the case of 40 - 75 % rhenium. In the system Cr-Re domains of solid solutions of rhenium in chromium occur. In the case of 70 = 85 % rhenium a chemical compound forms which possesses a hardness of 1000 kg/mm². A smaller addition of rhenium to chromium increases the plasticity of chromium. In the system Zr-Re two chemical compounds forms 1) In the case of 50% rhenium = ReZr, with a melting point at 1900°C and an hardness of 800 - 1000 kg/mm²; 2) In the case of 70 - 80% rhenium = Re Zr, with a melting point at 2400°C and an hardness of 1200 kg/mm². Solid solutions of rhenium in \$\beta\$-zirconium occur at up to 15 % rhenium. In the system Mn-Re with up to 5 % rhenium solid solutions occur. On addition of 24,6 %

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78-3-3-46/47 Alloys of Rhenium With High-Melting Metals (Mo, Ti, Zr, Ta, Ni, Co, Cr, W, Mn)

rhenium a polymorphous transformation of β to α occurs, at 760° C. In the system W-Re with 60% rhenium a phase of W-Re forms, with a melting point at 3007° C. In this system an 6-phase also occurs at 35-58 At% as well as solid solutions of tungsten in rhenium at 75% rhenium. In all investigated systems the produced alloys have a lower melting point than rhenium. There are 17 figures, 6 tables, and 35 references, 12 of which are Soviet.

ASSOCIATION:

Institut metallurgii im. A. A. Baykova, Akademii nauk SSSR, Moskva (Moscow Metallurg ical Institute imeni A. A. Baykov, AS USSR)

Card 3/3

sov/78-3-9-22/38

AUTHORS:

Savitskiy, Ye. M., Terekhova, V. F., Novikova, I. A.

TITLE:

The Phase Diagram of the Alloys of the System Magnesium-Neodymium (Diagramma sostcyaniya splavov sistemy magniy, neodim)

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1958, Vol 3, Nr 9, pr 2138-2:42

(USSR)

ABSTRACT:

The thermal analysis, the microstructure, and the determination of the microhardness were used for the construction of the phase diagram of the system magnesium-neodymium. The hardening method was used for the determination of the solubility of neodymium in magnesium in solid state. Chemical compounds of neodymium and magnesium exist in the solid solutions of neodymium in magnesium within the range of 40 - 60 percents by weight neodymium. Considerable structural changes of the alloys occur with an increase of the neodymium content up to 1%. If neodymium is added to magnesium, the hardness is increased and the mechanical properties of the alloys are improved. The strength and plasticity of the alloys in the system neodymium-magnesium in the region of the solid solution on the basis of magnesium are increased with rising neodymium content. At 150

Card 1/2

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

sov/78-3-9-22/38

The Phase Diagram of the Alloys of the System Magnesium-Neodymium

and 250°C the alloys of magnesium with neodymium are considerably more solid than pure magnesium. The microstructure of the alloys changes to a great extent in alloys with 10% neodymium,

they reach the maximum dispersion at 25% neodymium.

There are 4 figures, 2 tables, and 7 references, 4 of which

are Soviet.

Institut metallurgii im. A. A. Baykova Akademii nauk SSSR ASSOCIATION:

(Institute of Metallurgy imeni A. A. Baykov, AS USSR)

January 21, 1958 SUBMITTED:

Card 2/2

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

SOV/24-58-4-6/39

Baron, V.V., Yefimov, Yu.V. and Savitskiy, Ye.M. (Moscow)

AUTHORS: The Structure and Properties of Alloys in the Vanadium-TITIE:

Molybdenum System (Struktura i svoystva splavov sistemy

vanadiy-molibden)

Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh PERIODICAL:

Nauk, 1958, Nr 4, pp 36 - 40'(USSR)

A vanadium-molybdenum phase diagram has not been published ABSTRACT:

so far. As Mo and V have the same crystal lattices, similar atomic diameters and identical electron structures, it is possible to assume that these two elements form a continuous series of solid solutions. This assumption has been confirmed experimentally when measuring the lattice

parameters of powder-metallurgical specimens of V-Mo. However, cast V-Mc alloys are reported to exhibit a second phase at between 10 and 60% Mo.

No data on the physical and mechanical properties of these alloys exist. The authors have carried out an investigation of the structure and properties of V-Mo alloys,

established their melting temperatures and constructed a

phase diagram for them.

Alumothermal vanadium, containing 95.5% V, 0.9% Al, 0.15% Fe, Cardl/4

SOV/24-58-4-6/39

The Structure and Properties of Alloys in the Vanadium-Molybdenum

System

0.2% C, 0.3% Si and a considerable quantity of oxygen, and molybdenum in the form of sintered rods, containing 99.00% Mo, 0.075% C. 0.04% Fe and traces of Si and W, served as raw materials. The alloys were prepared in an arc furnace, provided with an insoluble tungsten electrode, in a helium atmosphere. The voltage applied was 60 V and the current 1 000 A, the electrode diameter being 8 mm. Each alloy was remelted four times in order to ensure even mixing, and each ingot weighed 60 to 70 g. Spectroscopic analysis of the alloys for impurities showed the presence of 0.01% each of Fe, Mn and Si and traces of Mg and W. The solidus and liquidus temperatures for alloys of various compositions were determined and a phase diagram constructed (Figure 1). This shows that all alloys are solid solutions. The as-cast structures were examined and hardness values determined. The specimens were then homogenised by annealing for 10 hours at 1 600 C in vacuo. The microstructures of the homogenised specimens were also examined and hardness, microhardness, plasticity under a compressive load and electrical resistance determined. Hardness was

Card2/4

SOV/24-58-4-6/39

The Structure and Properties of Alloys in the Vanadium-Molybdenum measured under a 50 kg load for 30 sec, microhardness System

The microstructures of the cast alloys are shown in Figure 2. The alloys with up to 30% V are single-phased. The alloys with 30-60% V show dendritic liquation and those with 80-90% V have a finely dispersed precipitate with a coarse-grained background. After the homogenising treatment (Figure 3) alloys with up to 60% V are single phased. Alloys richer in vanadium have coagulated particles (mainly Al₂0₃) in the grain boundaries and within the Homogenisation also results in grain growth.

Addition of vanadium to molybdenum results in an increase in The alloys have a greater hardness before the homogenising treatment (Figure 4, Curves 1 and 2). The maximum hardness is 380 kg/mm² for the as-cast allcys and 315 kg/mm² for the homogenised alloys. Microhardness (Figure 4, Curve 3) is higher and the maximum is

The difference between the hardness at 60-70% V. 675 kg/mm Card3/4

CIA-RDP86-00513R001447410018-1"

APPROVED FOR RELEASE: 03/14/2001

The Structure and Properties of Alloys in the Vanadium-Molybdenum System

and microhardness values is due to the preparation of the microsections and the presence of the intergranular constituent. The hardness-composition curve is the normal type for metals forming unlimited solid solutions. The plasticity decreases with increase of the second component (Figure 4, Curve 4), especially in the region

40 - 60% V where the tensile strength is $100 - 150 \text{ kg/mm}^2$. The greatest plasticity is shown by pure molybdenum. The electrical resistance-composition curve at room temperature is shown in Figure 5. The curve is similar to the hardness curve with a maximum of $50 \, \mu\Omega/\text{cm}$ at $60\% \, \text{V}$. The results obtained confirm that V and Mo form a continuous series of solid solutions. There are 5 figures and 7 references, 2 cf which are Soviet, 1 German and 4 English.

SUBMITTED: November 28, 1957 Card 4/4

21(1)

. AUTHORS:

SOV/89-5-6-2/25 Sergeyev, G. Ya., Titova, V. V.,

Savitskiy, Ye. M., Zhul'kova, A. A.,

Nikolayeva, Z. P.

TITLE:

The Mechanical Properties of Uranium (Mekhanicheskiye

svoystva urana)

PERIODICAL:

Atomnaya energiya, 1958, Vol 5, Nr 6, pp 618-623 (USSR)

ABSTRACT:

The test apparatus (IM. - 4.1) with which the hardness of uranium at increased temperature and the expansion of uranium at increased temperature were investigated in a neutral gas (argon), are represented by two sectional drawings. Measuring results are given by a graph. The following details are

mentioned:

The hardness of the uranium decreases with increasing temperature. If temperature rises up to 600°C, hardness decreases from 350 kg/mm² to 50 kg/mm². A regular variation of hardness in dependence on the carbon content of the uranium

(0.07 to 0.24 %) was not observed.

The presence of carbon in uranium samples influences outflow pressure if these samples are pressed in the d-phase. The outflow pressure increases with an increasing carbon content

Card 1/3

The Mechanical Properties of Uranium

SOV/89-5-6-2/25

(0.09 to 0.24 %). At 650°C and a degree of deformation of 75 % the outflow pressure increases by about 60 %. For uranium in the %-phase outflow pressure decreases from 4 kg/mm² at 830°C to 1.8 kg/mm² at 1050°C. Ultimate strength and creep strength increase with an increasing carbon content in the uranium. In hot-rolled uranium with a C-content of 0.01 % ultimate strength is $6 \text{ b} = 36 \text{ kg/mm}^2$, in uranium with 0.24 % C-content $6 \text{ b} = 52 \text{ kg/mm}^2$. The creep strengths in these cases amount to 23 to 31 kg/mm². At temperatures of from 100 - 150°C all mechanical properties characterizing the strengths decrease monotonously, whereas the properties that characterize plasticity increase. For urenium with 0.12 % C-content one finds that at 750° C $6 = 12 \text{ kg/mm}^2$, 8 = 18 % (relative elongation), $\Psi = 51 \%$ (relative narrowing of the pressed surface), at 600°C $G_b = 7 \text{ kg/mm}^2$, G = 23 %, $\psi = 76 \%$, and at 850°C $G_b =$ 0.8 kg/mm^2 , $\delta = 31 \%$, $\psi = 97 \%$. & -uranium, which has a volume-centered lattice, has the highest degree of plasticity. The tetragonal $oldsymbol{eta}$ -uranium is inclined to be brittle, and velocity of deformation is more

Card 2/3

The Mechanical Properties of Uranium

sov/89-5-6-2/25

sensitive to temperature. Because of the low symmetry of the rhombic lattice of &-uranium, the latter is characterized by sharply marked anisotropic properties. There are 13 figures, 2 tables, and 3 references.

SUBMITTED:

July 16, 1958

Card 3/3

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

129-58-8-1/16

AUTHOR: Savitskiy, Ye. M., Doctor of Chemical Science, Professor.

TITLE: Physico-Chemical Properties and Fields of Application

of Rare Metals (Fiziko-khimicheskiye svoystva i oblasti

primeneniya redkikh metallov)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, Nr 8,

pp 2-17 (USSR)

12年1月2日中 **秦**安州 (1943年) 原安斯斯斯斯斯特 (1955年) 医克斯特斯斯特氏病 (1955年) [1955年]

ABSTRACT: In the first part (pp 2-3) a general review is given of the properties of rare metals, in the second part (pp 3-13) the fields of application of the following (pp 3-13) the fields of application of the following rare metals are discussed: beryllium, cesium and rare metals are discussed: beryllium, cesium and rubidium, strontium and barium; the high melting point rubidium, strontium and barium; the high melting point metals: zirconium, hafnium, vanadium (of which the USSR has the greatest reserves of raw materials in the world), has the greatest reserves of raw materials in the world), niobium, tantalum, rhenium; the scattered rare elements: germanium, indium, gallium, thallium, selenium, germanium; rare earth metals (about which very little information is given). Most of the information contained

Card 1/2

129-58-8-1/16

Physico-Chemical Properties and Fields of Application of

in the paper is based on published non-Russian data. There are 22 references, 21 of which are Soviet,

ASSOCIATION: Institut metallurgii AN SSSR (Institute of Metallurgy, Ac. Sc., USSR)

- 1. Rare earth elements--Properties 2. Rare earth elements--Applications 3. Rare earth elements--USSR
- Card 2/2

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507, 30-38-8-17/43

Investigations of Rhenium Problems. Transactions of the All Union Conference

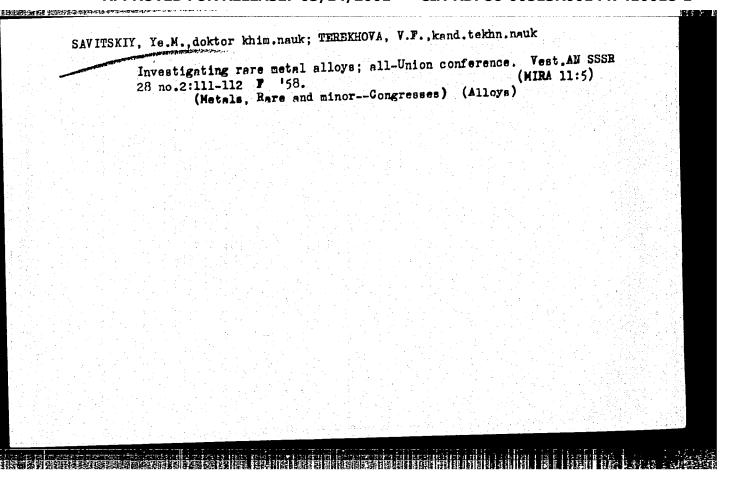
of production technique, of analysis sethols, of physical and chemical properties of rhenium and or its scope of applicability. Attention was directed to the insufficient production of rhenium and to the low degree of surity of the final product, to the high costs and to the slow dyinge of work intended to extend the ray material base. honium can be used in industry for a number of special pur oses, (for electric contacts, for parts in radio angineering, for thermocouples, as an addition in heat-resistive alloys and for other purposes). Immediate atems must be taken in order to increase the rhenium production. It was considered necessary to set up a special coordination commission at the Institute of Metallurgy imeni A. A. Baykov.

Card 2/2

SAVITSKIY, Yo.M.; BARON, V.V.; IVAZOVA, E.B.

Investigation of the recrystallization of niobium and its alloys. Inzh.-fiz.zhur. no.11:38-45 H '58. (MIRA 12:1)

1. Institut metallurgii imeni A.A. Baykova AN SSSR, g. Moskva. (Niobiun--Metallography)



20-118-4-26 '61

AUTHORS:

Savitskiy, Ye. M., Tylkina, M. A., Tsyganova, I. A.

TITLE:

The Recrystallization Diagram of Tantalum (Diagramma re-

kristallizatsii tantala)

PERIODICAL:

Doklady Akademii Nauk SSSR, 1958, Vol. 118, Nr 4, pp. 720-722

(USSR)

ABSTRACT:

There are no data in publications on the recrystallization of cast tantalum. In recent time, however, the smelting of tantalum in the arc is more and more used. The high corrosion resistance of tantalum in an aggressive medium, the low fusibility and high plasticity which permits a cold working, as well as many other properties permit to count tantalum among the as many other properties permit to diagram in question comtechnically most important metals. The diagram in question combines the grain size with the degree of deformation and the temperature of the subsequent annealing. It is therefore especially necessary for the metals worked by means of deformation. The results obtained will make possible to choose the deformation—and annealing conditions in such a way that the optimum mechanical properties of the products are guaranteed. The authors constructed a diagram of the type I for the cold working (rolling) of the cast tantalum (figure 1). The

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APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

The Recrystallization Diagram of Tantalum

20-118-4-26/61

conditions of cooling on a copper furnace bottom favored the formation of a coarse-grained structure in tantalum (figure 2a). Cast bars were cold-worked by forging until rods 7 x 7 were produced. They were annealed in vacuum at 1300° C for two hours. Thus the coarse-crystalline structure was completely transformed in a recrystallized, fine-grained, polyhedral structure (grain diameter 10-11 m, figure 2 b). Such rods served as initial material for the experiments. The rods were cold-rolled without intermediate annealing, with a shrinkage of 2,6; 5,7; 8; 10; 15; 34; 50; 68; 83; 90; 96; 98; 6%. The rolled rods were cut into pieces of 8-10 mm length and annealed in vacuum at 1000-2500 for one hour. The line of the beginning of the recrystallization in dependence on the deformation degree is plotted in a dotted line in figure 1. The temperature of the beginning of the recrystallization of tantalum drops with the rising deformation degree from 2,6 to 84% from 1300 to 1200° C. Figure 3 gives some radiographs of tantalum. The cold-rolling up to 15% deformation distorts the lattice of tantalum and deforms the individual grains. The microstructure is, however, not considerably modified. In the case of shrinkage of more than 30% a distinctly marked rolling-texture becomes visible (figure 2 v). The grains are

Card 2/4

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447410018-1"

The Recrystallization Diagram of Tantalum

20-118-4-26/61

changed to a great extent and extended up to 50 - 60% shrinkage without size reduction. In the case of a deformation of 90% the grain diameter amounts to 1 - 24. Annealing at 1000 -- 1600° C does not lead to a considerable enlargement of the grains. A recrystallization at 1200° C leads in samples with a high deformation degree and a recrystallization at 16000 in all samples to a complete blur of the rolling texture and to the appearance of new fine crystallized grains of a diameter of 6 - 13M. The annealing at 1800 - 2000 C leads to an abrupt change of size of the grains in connection with a collecting recrystallization (figure 2 g,d). The grain size increases threefold up to 31 Mand at 20000 C at 1800° C tenfold (up to 115M). The maximum sizes of the grains which correspond to the critical deformation degrees become visible in the isothermal lines of annealing at 1800 and 2000°. In the annealing at 25000 C an apparently specific property of tantalum becomes visible: the size of the grains increases to an extremely great extent (320 - 500 M). The properties of hardness and strength of tantalum in individual deformation degrees and annealing temperatures admit the assumption that the optimum annealing treatment lies at 1300 - 1400° C. There are 3 figures and 5 references, 1 of which is Soviet.

Card 3/4

.The Recrystallization Diagram of Tantalum

20-118-4-26/61

PRESENTED:

August 3, 1957, by I. P. Bardin, Academician

SUBMITTED: July 25, 1957

AVAILABLE: Library of Congress

Card 4/4

20-119-2-23/60

AUTHORS:

Savitskiy, Ye. M., Tylkina, M. A., Povarova, K. B.

TITLE:

Rhenium Recrystallization Diagram (Diagramma rekristallizatsii

reniya)

PERIODICAL:

Doklady Akademii Nauk SSSR, 1958, Vol 119, Hr 2,

pp 274 - 277 (USSR)

ABSTRACT:

Rhenium has different mechanical and physical properties which distinguish it from other metals and which are also of interest for modern engineering. Rhenium is a high melting metal, its melting point is at 3160°C. It has mechanical high strength and plasticity properities at room temperature as well as at higher temperature. The following is characteristic for rhenium: high resistance to wear, and resistance against corrosion in various aggressive media. The electric resistance of rhenium is higher than that of tungsten. Also other properties offer wide prospects for the use of rhenium in different fields of engineering. The recrystallization diagram of rhenium has hitherto not yet been published. The authors investigated the recrystallization diagrams of rhenium after cold deformation

Card 1/4

Rhenium Recrystallization Diagram

20-119-2-23/60

(rolling) of cast and metal-powder samples. As initial material served the powder of metallic rhenium which had been reduced from potassium perenate (perenat kaliya). From this powder the samples were produced by powder metallurgical methods. These rhenium bars were melted in an arc furnace in an argon atmosphere at a pressure of 200 torr. The coarse crystalline structure of the cast metal could be removed. The samples had a recrystallized polyhedral structure with a grain diameter of 40µ and served as initial material for the whole work. The treatment of the samples is shortly discussed. The temperature at the beginning of recrystallization was determined by means of X-ray methods from the occurence of the first points on the diffraction rings. A diagram shows the temperature of the beginning of recrystallization of rhenium as a function of the degree of cold deformation. This temperature drops with increasing deformation degree 1750°C at 5% deformation to 1200°C at 40 -60% deformation. In cold deformation of rhenium the grains were crushed. In the case of low compression degrees the formation of deformation twins is observed in rhenium. Further details are discussed. The temperature of the beginning of re-

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Rhenium Recrystallization Diagram

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crystallization of powder metallurgical rhenium drops with increasing deformation degree from 1850°C at 5 % to 1500°C at 48% of deformation. A diagram shows the dependence of the size of the grains on the temperature of annealing as well as on the degree of deformation. The temperature of the beginning of crystallization of molten rhenium is lower than that of the beginning of recrystallization of powder -metallurgical rhenium which is explained by the different degree of purity of the material as well as by the presence of a microporosity in powdermetallurgical rhenium. According to the data on the recrystallization and on the change of the hardness of rhenium the optimum temperature for annealing of the rhenium deformed with a compression degree of more than 10% the temperature range from 1750 - 2400°C can be assumed. There are 4 figures and 7 references, 5 of which are Soviet.

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Rhenium Recrystallization Diagram

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